Diode Laser Hygrometer (DLH) Measurements of Water Vapor Mixing Ratio for ATTREX

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ATTREX Science Team Meeting
August 26, 2010

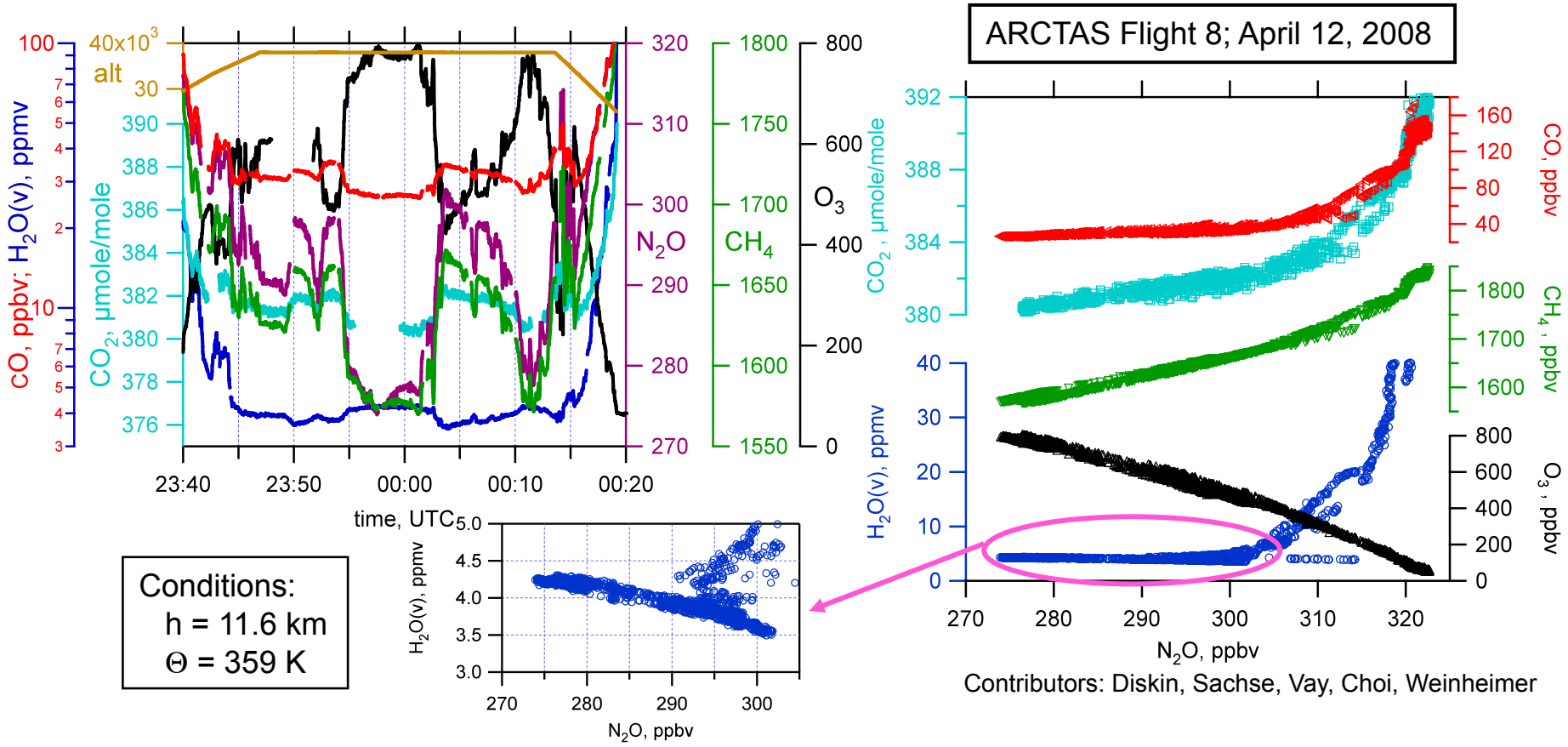
Diode Laser Hygrometer (DLH) - description

- Tunable diode laser spectrometer operating in the 1.4 µm spectral region
- Wavelength moduation at ~3 kHz
  - data analysis based on 2F, 4F demodulation, normalized by signal power
- Line-locked to absorption line in low-pressure reference cell
- Uses one of three absorption lines, depending on conditions (primarily altitude)
- Double-pass external path configuration
  - "mirror" is panel of retroreflecting roadsign material
  - sample volume is primarily outside of aircraft boundary layer
  - Internal optical path is purged with dry air or N_2
  - no inlet effects, such as condensation, evaporation, hysteresis, etc.
  - long path-length, combined with line-locked, harmonic detection allow excellent sensitivity and rapid time response
  - normalization by return power allows measurements to be made within clouds
  - Cloud extinction can be assessed from return power signal
- Realtime mixing ratio determination using onboard pressure, temperature
- Currently plan to take DLH to AIDA facility in January 2011 for mixing ratio and extinction characterization

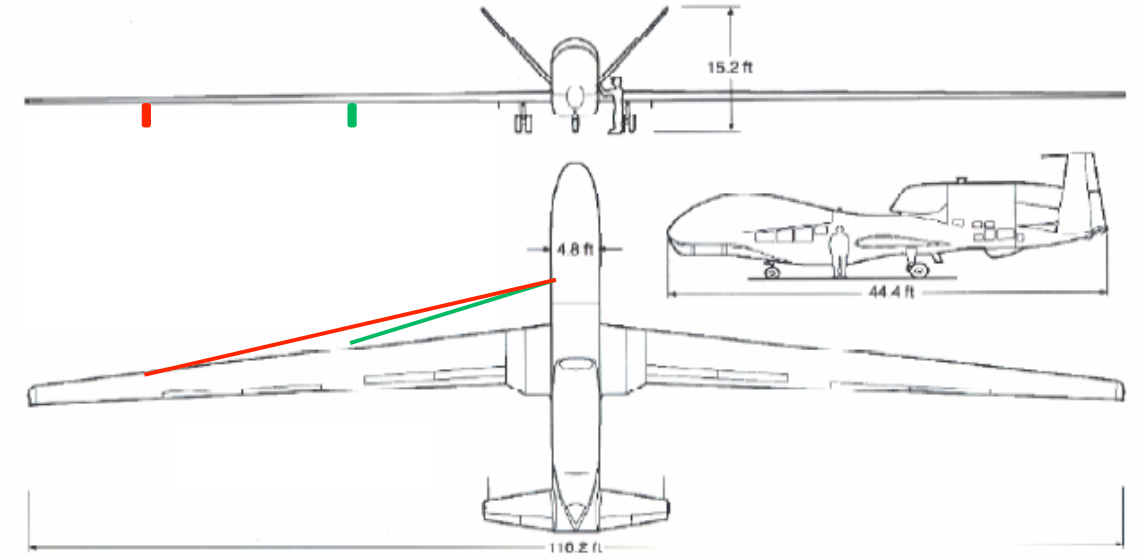
Diode Laser Hygrometer (DLH) - data

- DLH has flown ~15 years, primarily on DC-8
- New, autonomous version flown since 2008, on DC-8, WB-57, Learjet, Twin Otter
- Global Hawk instrument will be electronically ~identical, optically unique

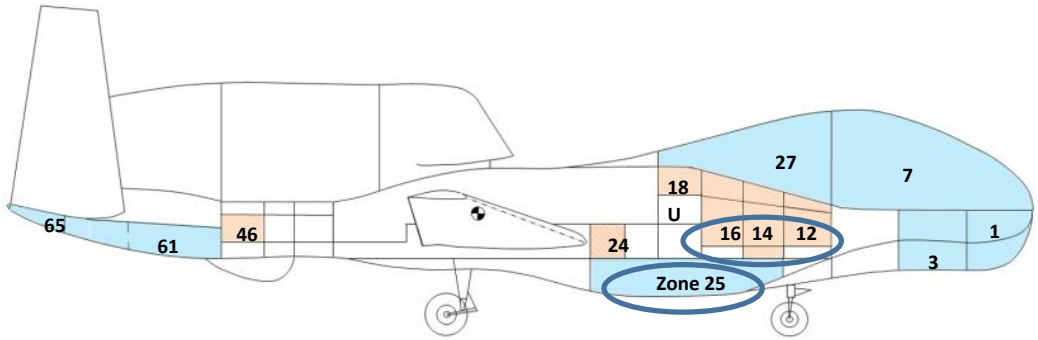
Data Example from DC-8



DLH Installation Opportunities on Global Hawk



Potential External Paths
- ~ 15m RT
- ~ 30m RT



Potential Mounting Locations

Acronym	Weight (lb)	Power (W)	Measurement Quantity	Sampling Rate	Precision (1σ)	Accuracy
DLH	50	280	H_2O vapor mixing ratio	100 Hz	1%, or 50 ppbv	10%